

The author strikes the proud owner pose with the upgraded 1993 K1100RS / EML Speed 2000



A Little More on the Side

Building a hack to my specifications...

By Michael S. Currin, PhD #54532

“Being at the right place at the right time” and “sometimes it’s who you know”, these two eternal truths came together at the 2005 High Performance Sidecar (HPS) Gathering in Maggie Valley, North Carolina. For a long time I had been thinking of upgrading my 1993 K1100RS with EML Speed 2000 sidecar rig to better keep up with the Yamaha FJR’s, Honda Blackbirds, and

Suzuki Hayabusa sidecar rigs ridden by some of the other gatherers. Obtaining the horsepower levels that these other bikes put out from my twelve year old K-bike was probably out of the question, so I was thinking about upgrading the handling.

I originally became interested in sidecars when my children came along. It seemed like a way to share motorcycling with our two boys, especially since our youngest has cerebral palsy and can

not safely ride on a motorcycle. Both of our boys have loved riding in the sidecar. The excitement of being dropped off at preschool in a sidecar and getting everyone’s attention is an awesome feeling. Kids would line up at the fence to see us arrive.

Driving a sidecar has its own challenges and joys, different than a motorcycle, but just as much fun. Most mornings it’s the sidecar rig that gets picked for the ride to work, leaving the two wheelers in the barn. Even the old reliable R80/7 was sold since it never seemed to get picked when it was time

to ride. A couple months after I got the K1100 rig, my wife decided she was also interested in sidecars and an R80RT with an EML Tour T sidecar showed up in the barn.

When I began the sidecar search, I had never heard the words “sidecar” and “high performance” used in the same paragraph, let alone same sentence. My original interest in the K1100RS / Speed 2000 was based on one picture sent to me by the former BMW dealer in St. Louis. No mention was made of performance; it just really looked good in the photo.

After reading some of the how-to-ride-a-sidecar information, I was a little worried about my first ride. I was pleasantly surprised at how well the rig worked right out of the box. There was none of the pulling to the right or left that I was expecting and after a while I started to find out how fast it could

really go around a corner. It was a lot faster than I ever would have expected.

The Speed 2000 sidecar was high tech for its day. The installation kit featured a Leading Link (LL) front end and 14 inch automotive wheels and tires for all three wheels. The LL front end is better than a traditional telescopic fork at handling the side force generated by a cornering sidecar. Also, it can be designed to use a much wider tire than would fit on the stock motorcycle front end. Automotive tires put a lot more rubber on the road than conventional motorcycle tires and since the rig does not lean there is no need for the rounded profile of motorcycle tires. The wider tires really make a difference in the cornering and stopping capabilities of an HPS rig.

The leading link front end had less trail than the original, making the steering easier. This is very important when running a 175-series car tire. The

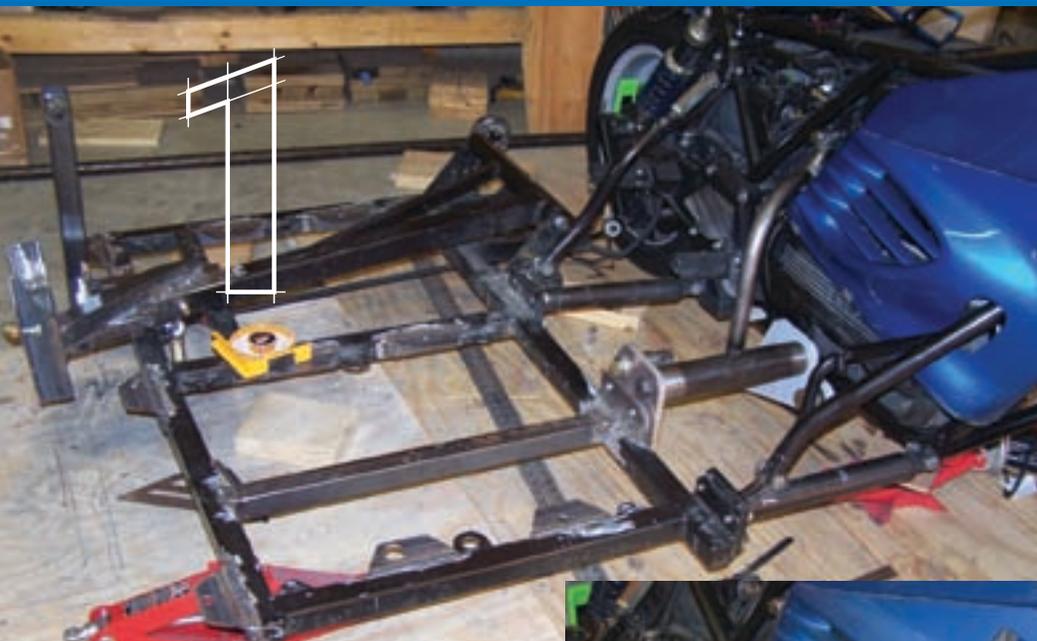
kit included a sub frame that ran under the K1100RS body work and tied to the bike at the steering head, front motor mounts, and at the transmission. This strengthened the bike frame for the

1 The sidecar frame was modified to move the body four inches to the right to provide more room for the front suspension. Other frame modifications were the addition of the mount for the swing arm pivot and extra bracing.

2 The bike side swing arm mount had to be designed to allow clearance for the brake pedal and to not block the oil sight glass.

3 The front swing arm was first tack welded together and all alignments double checked.

4 Once the swing arm was completed the front shock mount was designed.



sidecar duty and also included mounts for the sidecar.

Among the attendees at the Gathering were Ruth Ann and David Hannigan, with one of their new Suzuki Bandit 1200 Bandito sidecar rigs. The Bandito is the first American-made sidecar setup to use Center Hub Steering (CHS). Prior to this, if you wanted to experience the handling advantages of this caliber of a rig you had to import a sidecar from Europe, an expensive and time consuming process or build your own. Hannigan has now added a CHS sidecar for BMW K1200 RS.

Center-hub steering has many advantages for sidecar use. One is the reduced camber change when turning, in other words, the front tire stays flatter to the ground, keeping more rubber on the road. With a telescopic or LL front end the tire rolls up on its edge when turning. The static friction can be greatly reduced, improving the ride and road handling ability. Also the front end can be designed to have adjustable caster (trail) going from quick steering for the twisties to slower steering for greater stability on the interstate.

The CHS design looks a lot like a

forward pointing single sided swing arm. Properly designed, they are more rigid than either a standard or leading link front end. Since all the components are on one side of the front end an automotive style wheel can be mounted using lug bolts. This makes removing the wheel much easier.

Also attending were Margie and Bill Ballou. Bill is the designer and fabricator of the CHS front suspension used on the Hannigan Bandito and K1200RS sidecar rigs. After some discussion, I learned that the prototype for the Bandito hub was still lying around Bill's machine shop and could be purchased for a suitably sized stack of cash. The only problem was there was no swing arm. I would be on my own to design and fabricate everything between the hub and the rig.

This started the wheels turning. A few years prior, I had added a sway bar connecting the sidecar suspension and the rear-wheel suspension, so I figured it couldn't be that much more work to add a new front end. (I have been known to occasionally underestimate the time and effort required to complete a project).

The next thought was if the 175/75 x 14 automotive tires that were originally on the rig were good, 195/50 x 16 tires had to be better, plus it would be nice to be able to use standard car rims; no more looking for a shop that can or is willing to mount and balance a 14-inch car tire on to a rim made to fit a motorcycle front axle. If I'm making that leap, I might as well make all three wheels capable of using the same rims and tires. So now I'm looking at a new hub to mount an automotive rim on the rear of the motorcycle, and also changes to the sidecar hub.

After a few days of sitting and staring at the rig, I had a basic concept of for my new front suspension. Instead of the short swing arm, pivoting in front of the radiator and going forward to the front hub, as used on the Hannigan rigs, I would use a long swing arm, pivoting between the bike and sidecar. There were several reasons for this. First, it would reduce the amount of caster change as the front end moved up and down through its suspension travel, second it would put less material in front of the radiator on a bike that already tended to run a little hot, and third it looked like



something I could build.

Pivoting the front-end swing arm between the sidecar frame and the EML sub frame that had been part of the original sidecar kit meant that it would no longer be possible to adjust the sidecar wheel toe in and bike lean out by adjusting the sidecar mounts. So I now had to redesign the sidecar wheel hub to be adjustable for toe in, ride height, and camber. Since I was going to have to modify it for different wheels anyhow, I might as well upgrade the sidecar brakes and move the sidecar body a couple inches to the right, give some extra room for the front swing arm and mounts.

I've never been accused of doing things half way. The new sidecar hub uses a rear hub from a front wheel drive Toyota Corolla, with a Honda Civic brake rotor and two Suzuki 600 rear brake calipers, one tied to the front brake, and one tied to the rear brake. The hub assembly bolts to the sidecar swing arm so that toe in and camber can be adjusted by shim washers.

By this time the prototype front hub had been delivered. It uses the same Toyota hub, but with a Mitsubishi brake

rotor and two 6 piston brake calipers from a Suzuki Bandit 1200. After about six months of Sunday afternoons in the barn with the Harbor Freight pipe bender, I had a forward-facing swing arm pivoting on tapered roller bearing on a 3/4-inch shaft between the bike and sidecar.

Then I had an adapter made to have the same lug bolt pattern on the rear wheel of the bike as is used on the sidecar and front wheel. The adapter would also have to offset the rear wheel

5 Much thought was given to wheel and tire size, to get both as wide a tire as practical and end up with the best final gearing.

6 The sidecar hub consists of a Toyota hub, Honda automotive brake rotor and two Suzuki brake calipers.

7 The EML sidecar swing arm pivots next to the bike and runs under the sidecar body. The new hub was bolted to the modified swing arm.

8 Top view of front suspension. The brake lines have since been redone.



slightly to the left so the tire would clear the rear suspension. After looking at many wheels, both aftermarket and OEM, I decided to use stock Mini Cooper wheels. They were the narrowest 16-inch wheels I could find, looked good, and plus they're akin to BMWs. I took one of the Mini Cooper hub caps to the local BMW shop, where the parts man helped me find some BMW roundels to cover the Mini logo.

After a couple of calls to Penske Racing, I had new shocks for the front end and sidecar. They have remote reservoirs and are adjustable for length, rebound, and compression. The sidecar shock uses a hose that is long enough to mount the reservoir between the bike and sidecar for easier adjustment. I had mounted a Penske shock on the rear of the bike a few years prior to this. The Penske people are very easy to work with when building custom shocks. They changed springs and valving at no additional charge, other than shipping, until I got what I needed.

While I was there, I decided to try and do something about how the bike tended to run a little hot since the addition of the sidecar. I tend to have a lot of "while I'm there" ideas, probably why my projects tend to take a little longer than planned. I had read somewhere that the older three core K-bike radiators could be made to fit a K1100 with just a little bit of work. It may have been a little bit of work if there wasn't already a sidecar sub frame fitted to the bike, but it did fit.

As with any project there are still a few tweaks to do, but all in all it works great. I'm very pleased. The first real test of the upgrades was at the Daniel Boone Rally, in Boone North Carolina. If you haven't been, you've missed some wonderful roads. It was a short ride from the rally to the "Snake," 489 corners in a 12-mile radius of Shady Valley, Tennessee (<http://www.shadyvalleycountystore.com/default.htm>). Highway 421 going up to Shady Valley is just as challenging as Deals Gap and includes much more elevation change. Even with a front shock spring rate about one-half what would finally be decided on the front end worked wonderfully.

The LL front end would push the front tire if I accelerated too hard from a stoplight with the bars turned left the rig would just push the front tire, going

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straight through the intersection, until I'd let off the gas, then the front wheel would hook up and the rear end slide around, and then the rig would turn. It can be very entertaining, if you're expecting it. Now the front end just hooks up and turns. With the caster adjustment set for quick steering it's like having power steering, but a little twitchy for on the interstate.

Before using just the front brake would cause the rig to veer to the left, with the coupled front and sidecar brake it stops straight, and with all that rubber it stops quickly. I did remove the ABS during this upgrade and so far have not missed it. Using the back brake gives just as straight a stop, just not as fast.

There were many hands in this project besides mine. Bill Ballou did a wonderful job on the CHS front hub and I'm sure Bill McSheehy had a hand in there some where. The rear hub adapter came from C Stanley Motorsports Corporation, Penns Creek, PA (570) 765-8310. Andy and Lucky at Custom Machine and Tooling (<http://www.cmtaltiforce.com/index.html>) were always able to fit my small machining jobs into their schedule. Gene Snyder, my step-father-in-law, did all the real welding after I tacked the pieces together. Bruce Pickett did some welding and machining and the guys at Lee's Automotive were always ready with advice and tutorials on the rear suspension of front wheel drive cars.

I need to thank my wife, Jody, for not complaining too much about the constant stream of UPS deliveries and let-

Laundry List

- Original EML Speed 2000 sidecar kit with sidecar, subframe, leading link front end, and 14 inch tires and wheels \$10,500 (1999)
- Professional rigging, painting, carpet, etc \$4,000 (1999)
- Swaybar upgrades \$350 (2004)
- Front hub and machine shop bill \$4000 (2006)
- Wheels 3 @ \$200 each = \$600
- Shocks 3 @ \$900 each = \$2700
- Materials (steel) \$200
- Brake lines, bearings, nuts and bolts \$300
- Plus, the original cost of the bike.



ting me have a break from the honey do list. I'm trying to get caught up.

Now that these upgrades are finished, the ante's been upped. Two of the gatherers have purchased Kawasaki ZX-14 to use as sidecar mules and one of the Hayabusas has added a nitrous kit. A Hannigan K1200RS rig has been spotted at Deals Gap. I wonder if anyone has a turbo kit for the K1100, maybe nitrous, or wonder if I could find a K1200 motor to fit in there. What about that new K1200RS, which should make a good sidecar mule. To be continued? 

For more information on high performance sidecars including more step by step details on the K1100 upgrades checkout the High Performance Sidecar forum and links at <http://hpsidecars.com/>.

Hannigan's High Performance offering are at <http://www.hannigan-trikes.com/content/home.html>. A couple of other sites of interest are <http://home.insightbb.com/~ralph1/index.html> and <http://hometown.aol.com/sidebike99/index.html>.

Dr. Currin has been riding motorcycles for 34 years. The first 20 years were on a 1967 Triumph chopper, which he still owns. Fourteen years ago he decided that his manliness would survive having electric start and a windshield and purchased a well used R80/7. Since then it's been BMW's. He is a civilian contractor at Ft Bragg, NC and resides in Erwin, North Carolina with wife Jody, sons Cody and Jacob, a couple dogs, several rabbits, some peacocks, chickens, ducks, and geese.

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